ASSEMBLY MANUAL
DIGITAL WRIST WATCH KIT LED-1

The ALPHA Digital Wrist Watch you have purchased incorporates the latest solid state technology featuring an LED display of Date, Hours, Minutes and Seconds on demand. However, because this product is marketed in kit form, (including your choice of either a FREE man's or ladie's case) we bypass manufacturing costs. Thus, Alpha is able to offer you the same quality and features normally found in watches costing as much as $150.00 more than the LED-1.

The construction of the LED-1 Digital Watch Kit involves the assembly of several small and delicate parts in extremely tight spaces. Therefore, it is imperative to follow closely the construction sequence as written and carefully heed the assembly tips, pre-assembly checks and precautions to component damage. Should any of the kit parts be missing or damaged, you must file a claim with the Post Office.

TOOLS AND MATERIALS REQUIRED

TOOLS: Very small tipped iron (27-40W), small solder (rosin core), toe nail clippers, small dykes, needle nose pliers, file, .024" drill bit & drill, shears for cutting brass, turning tool for trimmer cap.
MATERIALS: Electrical tape, #32-34 AWG bare wire, epoxy, silicone rubber (RTV).

READ BEFORE YOU START ASSEMBLY

As the IC used is CMOS, precautions to prevent damage from static discharge are necessary. Use only a small, grounded soldering iron, and wear no static producing clothing during assembly. Be sure to observe correct orientation of the component leads and use fine solder with rosin flux to prevent bridges between closely spaced foil conductors.

WATCH ASSEMBLY

PC BOARD PREPARATION

The PC board patterns are layed out for the man's or ladies's watch. The IC side of the board has delineation marks for the man's case and the display side has delineation marks for the ladie's. (The two donut pads on each side of the board are for registration of the art work and are ignored after the board is made.)

After selecting either the man's or ladie's case, trim the excess from the PC board using the case as a template. Fit the PC to your case, eliminating uneven edges. It is important to fit the board accurately and carefully prior to component mounting.

The battery and crystal areas of the PC board on both the man's and ladie's watch are to be cut out. See Fig. 1. Note that the battery cut outs are on either side of a PC foil tab. Do not cut it off. Also, allow space for the thickness of the battery contacts. Test the PC fit by putting the PC board, xtal, batteries and piece of shim brass in the case.

The foil pattern on both sides of the PC board will later be connected together at A,B,C,D,E,F,G,+,1,2,3,4 and colon. Notch the board (ladie's board) at these pads. See Fig.1. Drill small holes (man's board) with a .024" drill bit just above the pads. A small flat notch is also filed next to the crystal to allow the C_2 trimmer tab to wrap around the board and connect to pin 10 of the IC. See Fig. 1.

COMPONENT PREPARATION & SOLDERING TIPS

Because of the close proximity of component locations, PC foil pads should be pre-tined. It will be necessary to preform and cut the leads of many components to allow the components to be dropped into position and "reflow" soldered in place. However, do not preform any leads at this time. A fine point soldering iron tip (3/32") will be necessary. If a small tip is not available, wrap wire around your tip allowing one end to extend past the soldering tip by 1/4". It will conduct sufficient heat for reflow.

COMPONENT MOUNTING

1. Form and trim the leads (Fig. 7A) of the 12 small transistors (red dot on top). Reflow to their pads above and below the display, refer to figure 1 & 5 for the proper orientation of their leads.
2. Test all displays per (Fig. 7B) before installation. Bad displays will be replaced only if the leads have not been bent, cut or soldered. Bend all the display leads straight out, then bend and trim the display leads carefully per (Fig.7B). The decimal points of digits 2 and 3 are used to form the colon. Cut the decimal point leads from digits 1 and 4 per (Fig. 7B). Digit 2 is installed upside down to place the decimal point upper left. The display lead connections are made in 4 layers with tape between each layer. Carefully study Figure 7C; (Layer 1) Pretin the leads of all digits and the foil pads for them on the board. Install digit 2 on the board. Reflow solder the leads noting connection of the decimal point lead. Repeat with digits 3, 1 and 4 individually. Be careful of bridges as the foil pattern is close. Retest all displays again before proceeding on with remaining assembly. Place a narrow strip of tape on the board under the straight leads on the upper and lower edges of the display digits and on the right side of digit "1". See photo in Figure 1. (Layers 2, 3 & 4). Starting on the lower edge bend the pin for segment "E" on each digit down against the tape. Solder one short length of thin bare wire to connect these pins together, starting from digit "4" and run the free end of this wire around the end of digit "1" and solder at the collector pad of Q5. (Fig. 1, shows layer 2). Place a piece of narrow tape over these leads and the wire. Repeat with the remaining pins on the upper and lower edge of the displays. The free end of each wire will connect to the collector pad of its respective transistor, ie., "D" to Q4, "C" to Q3, "G" to Q7, "A" to Q1 and "B" to Q2. Note that "G" segment of digit "2" is connected by a foil lead to "G" of digit "1".
3. Install trimmer C_2 on the board. As noted earlier wrap one lead of it around the board thru the notch and solder on the other side. Trim the tape on the leads of the bottom edge of digits 1 & 2 to clear C_2 if necessary.
4. Install only R_3, R_4, R_8, R_9 resistors on the IC side of the board by reflowing their leads to the pads.
5. The IC supplied is a CMOS device. Be sure to ground anything which may carry a static charge i.e., work bench, iron, tools, clothing and even yourself. Remove the IC from its conductive sponge packing or carrier. See Fig. 7D. Do not bend the leads sharply at their exit from the package or they may break off. The IC is not covered by any manufacturers' warranty when supplied in a kit. Therefore, replacements will be available by purchase only. Bend the IC leads down 1/32" from their exits from the package. At a point about 3/32", from the package bottom bend the leads out at a 90° angle. Place the IC over its pads on the board and clip the excess length from the leads.

Note the "1" etched on the PC board. Orient the IC so that its pin 1 is nearest this "1" on the board. See figures 4 & 6. Pretin the PC foil pads and the leads and reflow the IC into place.

6. Reflow solder R_5, R_6, and R_7 into place; R_5 & R_7 first, then R_6 over and between R_5 & R_7. Fig. 3,4, & 6.
7. Clip and bend the leads of Q_{13} and Q_{14} in figure 7E. Prepare two, 1" lengths of insulated wire to be connected to the bases of Q_{13} and Q_{14}. Reflow Q_{13}, Q_{14} and the wires to their pads on the board. Solder a bare short wire to the pad on the board edge below and right of Q_{14}. This will be soldered to the case connecting the case to the system's ground.
8. Wrap the case of the crystal with tape. Bend its leads per figure 7F. Clip the leads of R_2 to 1/16" and solder between the crystal leads near the header. Solder the crystal in place on the board.
9. Form and clip the leads of C_1, leaving one lead long enough to go in the notch or hole previously made in the board connecting C_1 to C_2 on the other side of the board. A 22pf & a 27pf have been furnished for C1. Use the 22pf first & if the watch runs fast, replace with the 27pf.

WATCH CHECK-OUT

Temporarily solder a wire to the "-" battery pads (one on each side of the board) and a short lead to the "+" pad. Using a 3 volt supply or 2, 1.5 volt flashlight cells connect power to the module.
The Q_{14} contact is display "Address" and Q_{13} is time "Set". Press your finger against the address contact and "-" battery terminal. If all is well, the display will light and show the hours and minutes. The display will remain lit for 1 3/8 seconds after the finger is removed from the contact. If it is pressed again before this time has elapsed, the display will show date and seconds. The display remains on as long as the contact is touched. Remove the temporary wiring.

CASE PREPARATION

In order to deburr the display opening and give the case a brushed appearance, lightly sand the face of the watch in one direction (length wise) with fine sand paper. Insulate the inside of the case with tape at any point where the foil or component leads may touch it, especially around the battery clip. Temporarily place the completed module into the case. Select two points for locating the time "Set" and "Address" contacts above and clear of the components on the case top (ladie's watch), or on the case side (man's watch). Mark these points. (See Fig.2). Remove the PC and drill and deburr a hole at each point. Select the drill bit to be about the same size or a little smaller than the tubing which will be installed in these holes. Slip a short piece of thin tubing into these holes with about 1/32" left on the inside of the case. Place a small piece of transparent tape over each hole and push an ordinary straight pin thru the tape over each hole until it rests against the case. Clip all but about 1/8" off the pins. Epoxy on the inside to waterproof. The band on the ladie's watch is attached by pins thru small diameter brass tubing soldered to the ends of the case with high melting temperature solder. Silver solder may also be used for this purpose. Install the gray light control film in the case with epoxy. Be sure to orient it so that the 18° slant of the louvers is toward the bottom of the display. If another type or style band is used, metal brackets can be cut and bent and attached to the case to hold the band. Alternately you may elect to make two parallel cuts on either end of the case to form a tab which may be bent to form a loop for band mounting. Drill holes in the man's case for band pins as shown in figure 2.

BATTERY CLIP MOUNTING

Cut and bend 3 pieces of .005" shim brass as shown in figure 7G. Clips 1 and 2 are reflowed onto the display side of the board on the "+" and "-" pads. Flow solder from the small pad on the IC side of the board to the clip from the "-" pad where the clip passes this pad. Reflow clip 3 to the foil pad on the board between the battery slots. Put tape on battery contacts wherever they are in close proximity to other components or wiring. Put insulation over the longer lead (+ lead) of the 47uf electrolytic (C3), and solder it at the junction of C1 and C2. Solder the other lead to the negative battery clip. See figures 3 and 6.

TIMESETTING

Hours and Minutes: Touch "Address" contact to display hours and minutes. Release this contact and touch "Set" contact before display blanks. Minutes will be blanked and hours will remain on. Touch the "Address" contact until the correct hour is displayed. The colon will pulse twice each second during the PM and remain on steady during the AM. To advance the date at midnight be sure to observe the colon during hour setting. Touch the "Set" contact again and hours will blank and the minutes will be locked on. Touch the "Address" contact until the correct minutes are displayed and again touch the "Set" contact until the display is blanked. Seconds and Date: Touch the "Address" twice in sequence. Touch "Set" before display blanks, until seconds blanks and date is locked on. Touch "Address" for correct date. Touch "Set" until date blanks and seconds are locked on. Touch "Address" and seconds will reset to "00". Release "Address". When the time corresponds to the time set in the watch, depress the "Address". The oscillator may be trimmed with a frequency counter or by trial and error. If a frequency counter is used, connect it to the crystal lead which is connected to pin 10 of the IC. Set the frequency to be a little less (about $.5_{Hz}$) than 32768_{Hz}, as the capacitive load of the counter will slow the oscillator down. Final trimming should be done by trial and error. The watch's accuracy can be made better than 1 or 2 seconds per month with careful adjustment of the oscillator frequency.

FINAL ASSEMBLY

Place the module in the case and solder the short bare wire from the "-" pad to the case. Connect the insulated jumper wires from the base pads of Q_{13} and Q_{14} to the ends of the straight pins. Install the batteries in their clips noting proper polarity. Push them down until they are against the top of the case. Cut the bottom cover from the plastic supplied and install it in the case. The bottom cover may be cemented with RTV rubber (for water proofing and easy removal) or friction fit. The S-312E silver oxide energy cells selected are rated at 38mah, and are commonly available at hearing aid or drug stores. They should last 8 months to one year when the time is addressed for 1 3/8 seconds 10 times per day. A larger cell (S31) may be used in the man's watch as more space is available.

PARTS LIST

(Sold for Replacement Only)
(Add $2.00 shipping and handling on all orders under $10.00)
(Sorry, No Charge Cards on Parts Orders)

C3	47uf	$2.50
C1	22pf (220K)or 27pf(270K)	$1.00
C2	15-30pf	$3.50
D1,2,3,4	man 31	$1.00
Q1-12	mmt 71	$1.00
Q13-14	2n5139	0.35
R1	1/8 watt 10% 33K	0.20
R2	1/8 watt 10% 10meg	0.20
R3-10	1/8 watt 10% 4.7K	0.20
IC1	SCL5440F	$25.00
LW/LD-1	PC board	$8.50
Xtal	32768Hz	$9.95

When corresponding about, or ordering parts for any kits, be sure to specify the kit model and style, and the specific part numbers, and/or component values. To expedite your parts order, send a cashiers check or money order.

TECHNICAL ASSISTANCE

We do not offer a repair service. However, we will be happy to advise you by mail or phone if you have difficulty getting the watch to work properly.

AUTHORIZED RETURNS

~~Any kit authorized for return will be accepted only if the kit is complete, undamaged and unassembled and is subject to a 10% restocking fee. In addition, shipping and handling charges will be deducted from any refunds. When requesting (by phone or mail) an authorization number to return parts or kits be sure to clearly state what it is you wish to return and indicate your reason.~~

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First for the Finest in
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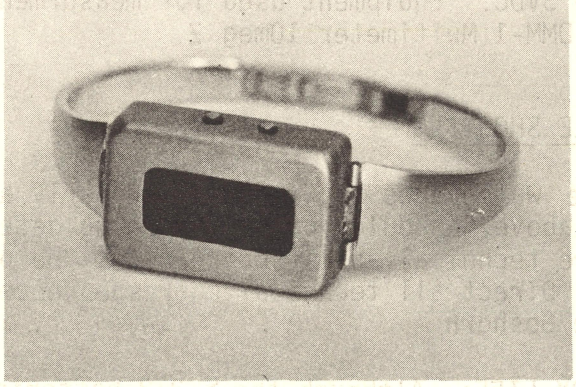
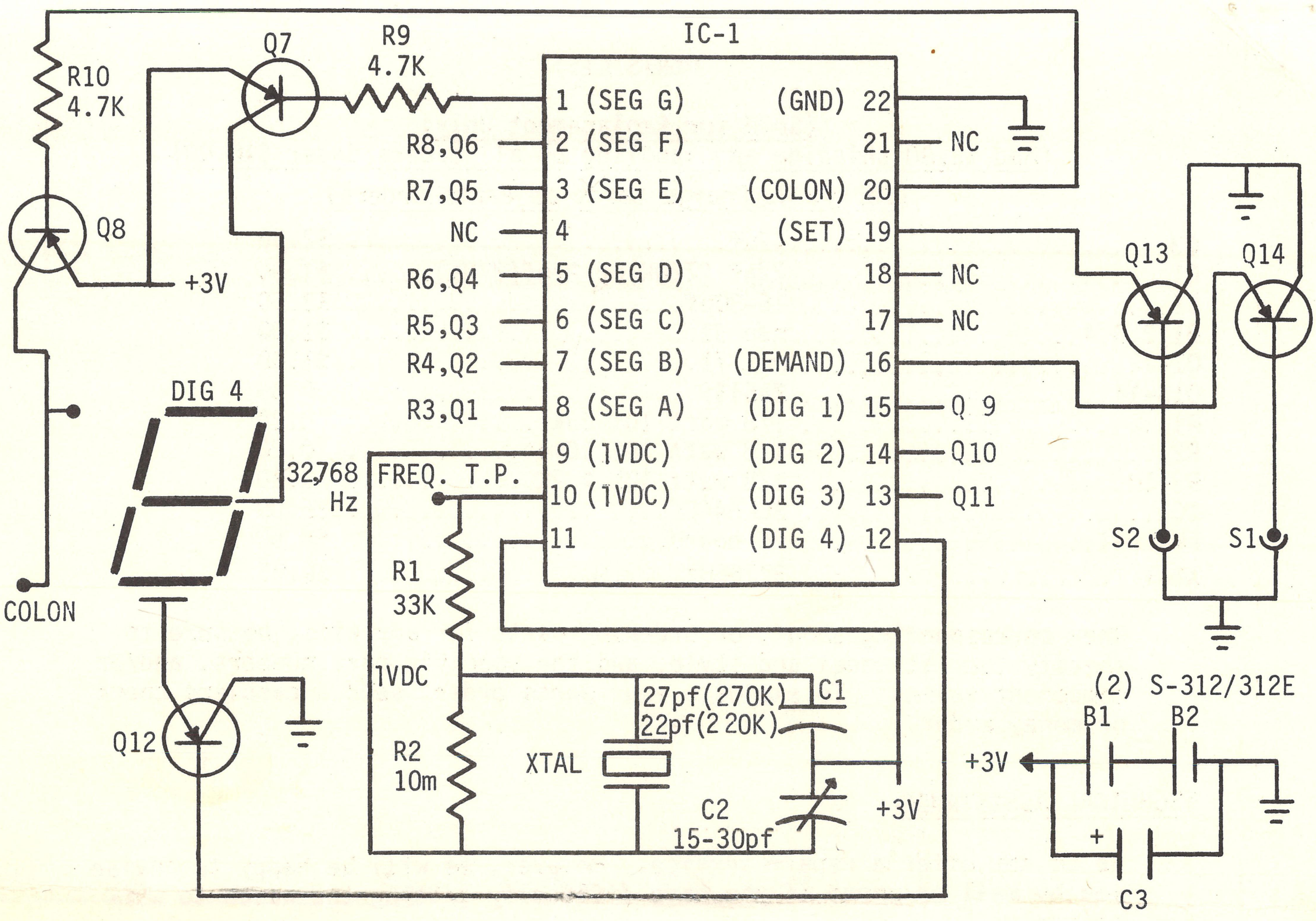
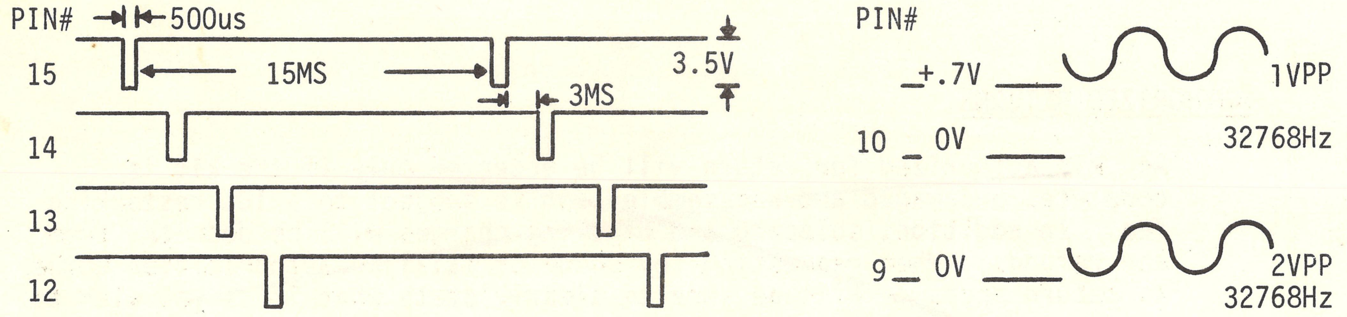
Advanced Builder





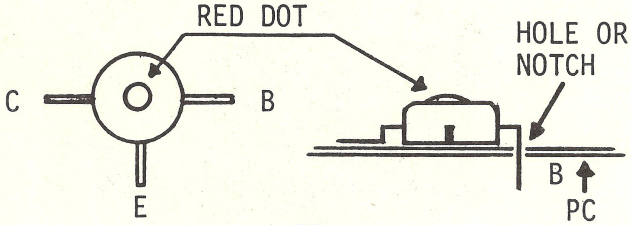


Wave form and frequency readings are with display off. Wave forms on pins 1,2,3,5,6,7,8,& 20 vary with character displayed and are not shown. Voltages on pins 1-3, 5-8, 12-16, 19 & 20 are 3VDC. Equipment used for measurment: Tektronix 7904, 10meg Ƶ 'scope W/10 x probe, Alpha DMM-1 Multimeter 10meg Ƶ.

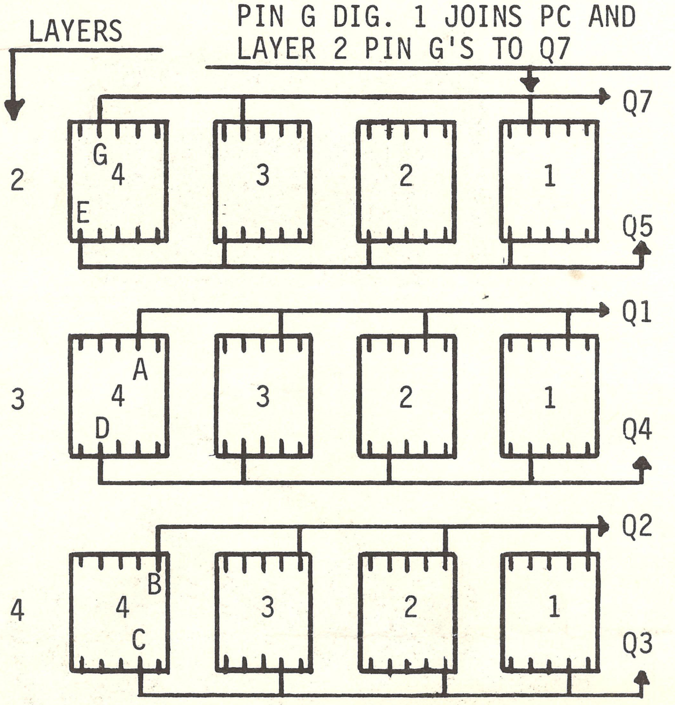
TROUBLE SHOOTING

If the watch does not function properly after assembly, check all voltages and waveforms noted above. Should you be unable to determine the cause of the malfunction and you require technical assistance from us, be prepared to supply the above mentioned information. Direct all technical correspondence to: Customer Service, Alpha Electronics, Attn: George Goshorn.

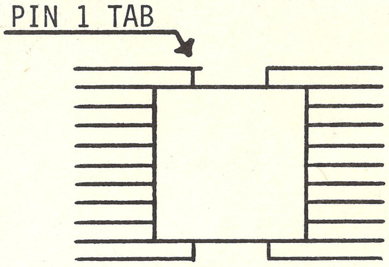
BATTERY LIFE: Although the S-312 batteries are well suited for use in the LED-1 when the display is addressed intermittently, continuous activation of the display for extended periods of time will sharply reduce battery life and cause inaccurate timekeeping.



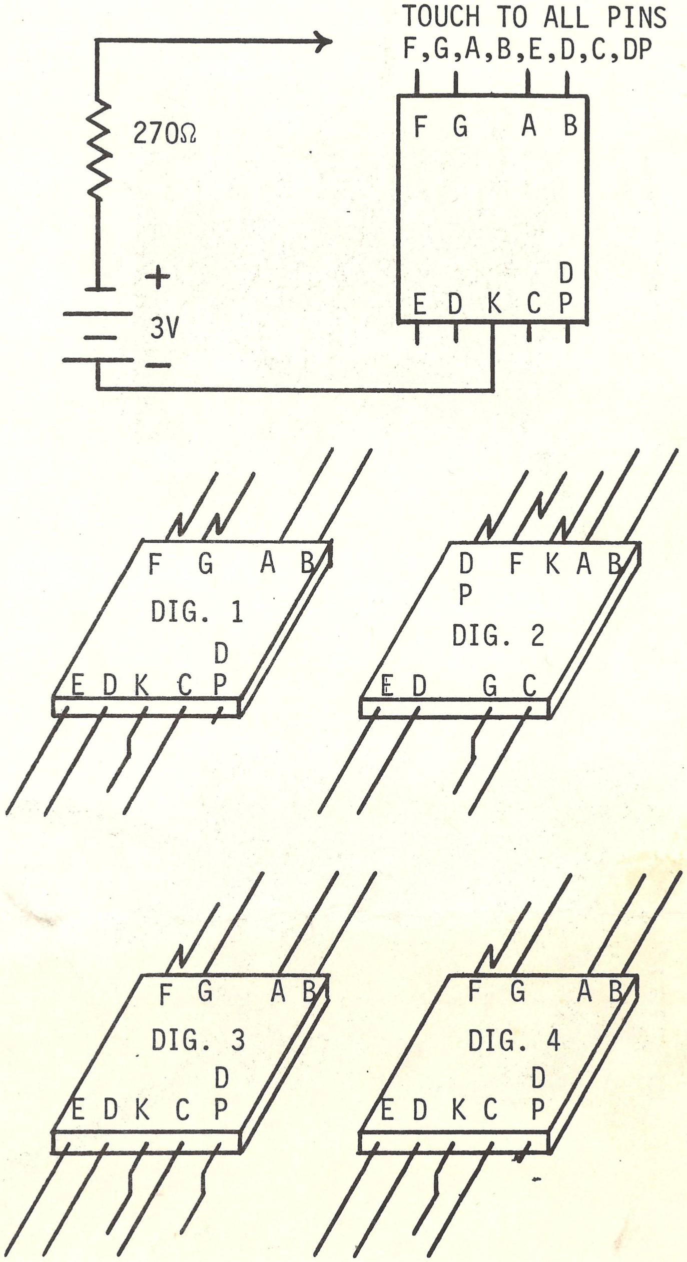
7A


PIN G DIG. 1 JOINS PC AND LAYER 2 PIN G'S TO Q7

7C

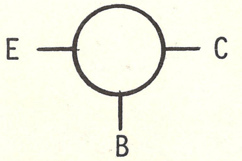


7D


TOUCH TO ALL PINS F,G,A,B,E,D,C,DP

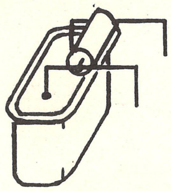
CLIP OFF DP OF DIG'S 1 & 4

7B

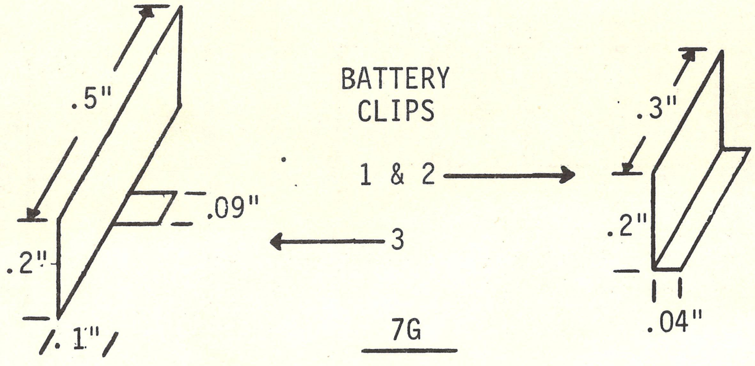


Q13 AND Q14 TOP VIEW

7E


CRYSTAL AND R2

7F



7G

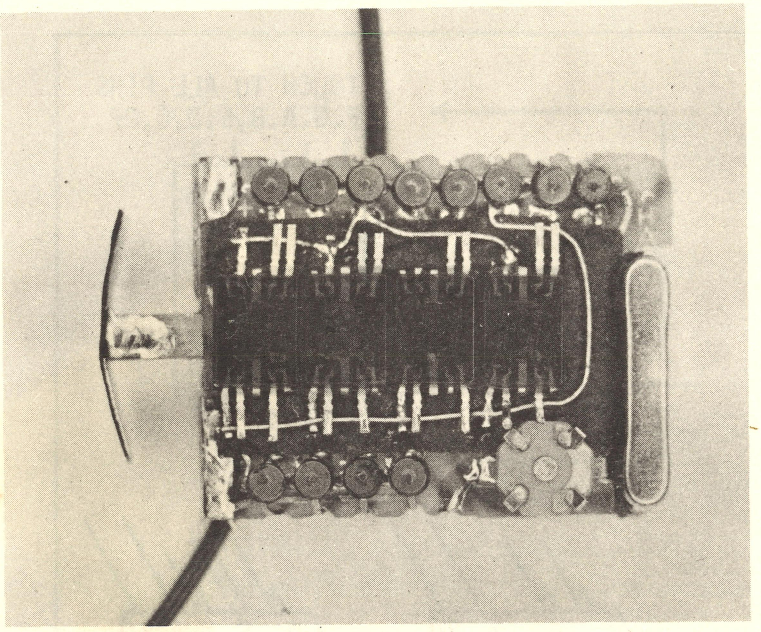
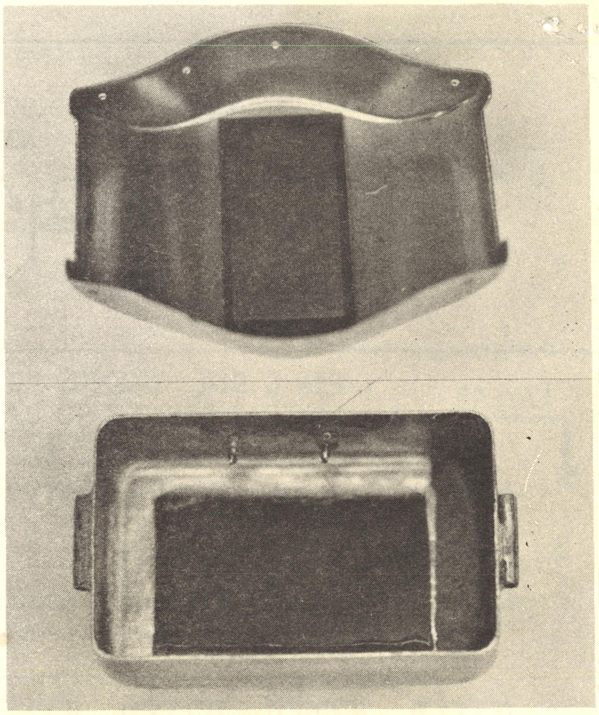


Figure 1



W

Figure 2

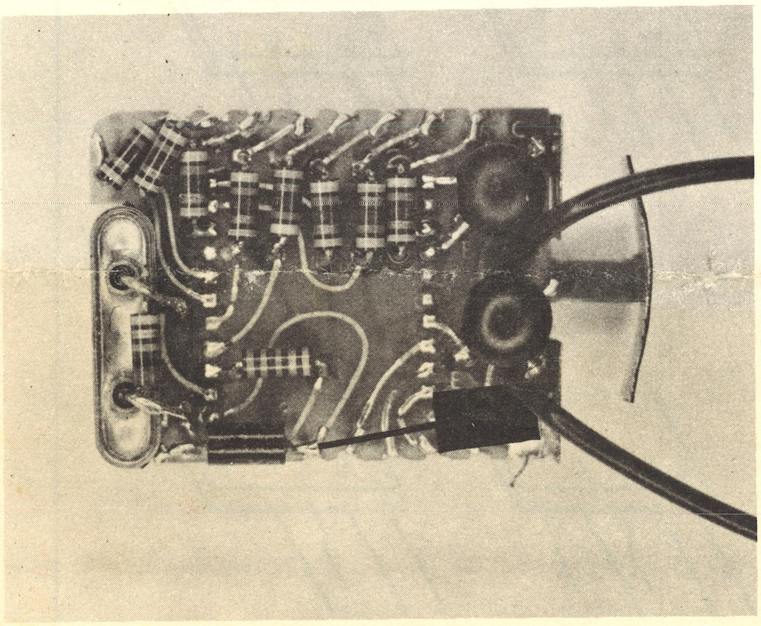


Figure 3

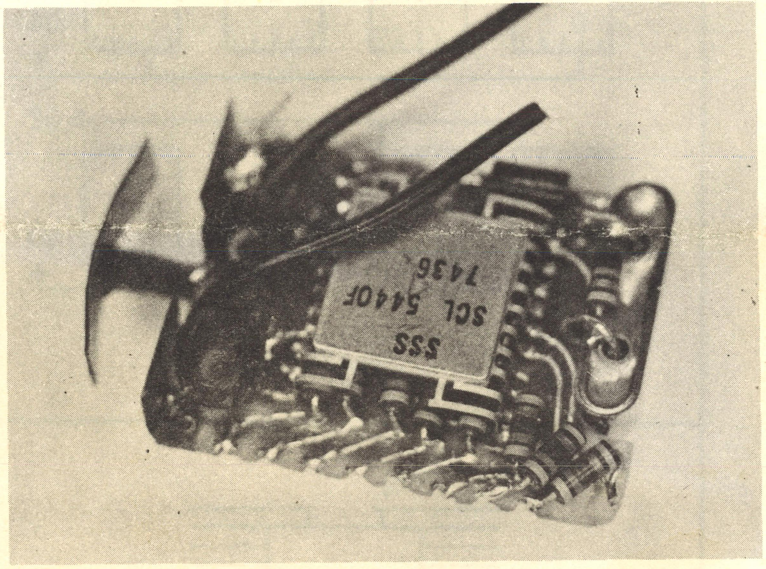


Figure 4

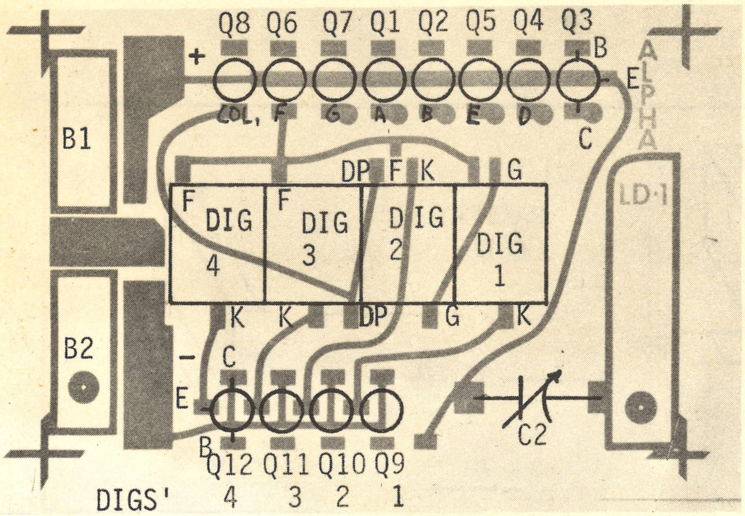
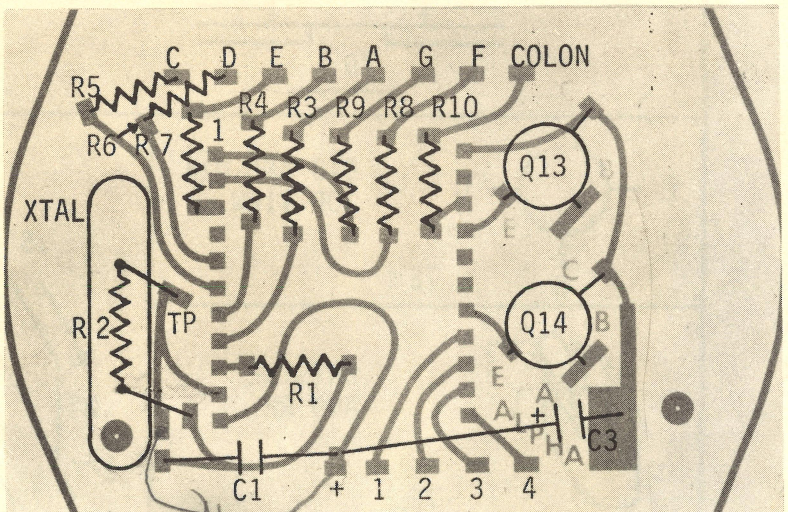


Figure 5



C2 Figure 6